TRICKS—

With High Frequency Electric Current

How the Amateur May Give Spectacular but Harmless Demonstrations of the Peculiar Qualities of that Form of Electricity that Is Used in Radio

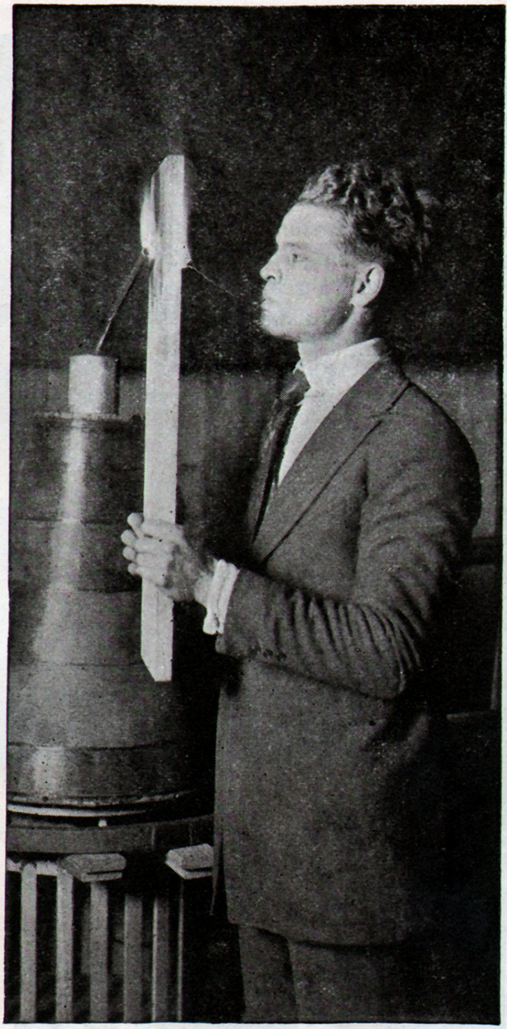
By

LEONARD R. CROW

TO the layman, demonstrations of high-frequency electric currents, such as are employed in radio, have an interest that is not lessened by the element of apparent danger with which they are attended. Some of these experiments are spectacular; to a peculiar degree they combine entertainment with instruction. The fact that many of these demonstrations can be easily staged as "tricks" give them an added value to the repertoire of both the amateur and professional entertainer.

Most of our readers will understand what is meant by an alternating current of electricity—a current which changes its direction of flow a certain number of times a second. Commercial currents, which light our homes, run our small power motors and revolve our electric fans, may change their direction of flow between one hundred and two hundred times a second. In such cases the frequency or cycles a second are one-half the number of alternations, as a cycle consists of two alternations.

Such currents of low frequency possess certain characteristics which make them dangerous to the human body at pressures of 200 or 300 volts; in many cases lower potentials have produced disastrous results. The low potential, low frequency currents are dangerous when only a small fraction of an ampere is forced through the body, causing contraction of the muscles and a "shock" which is often fatal.



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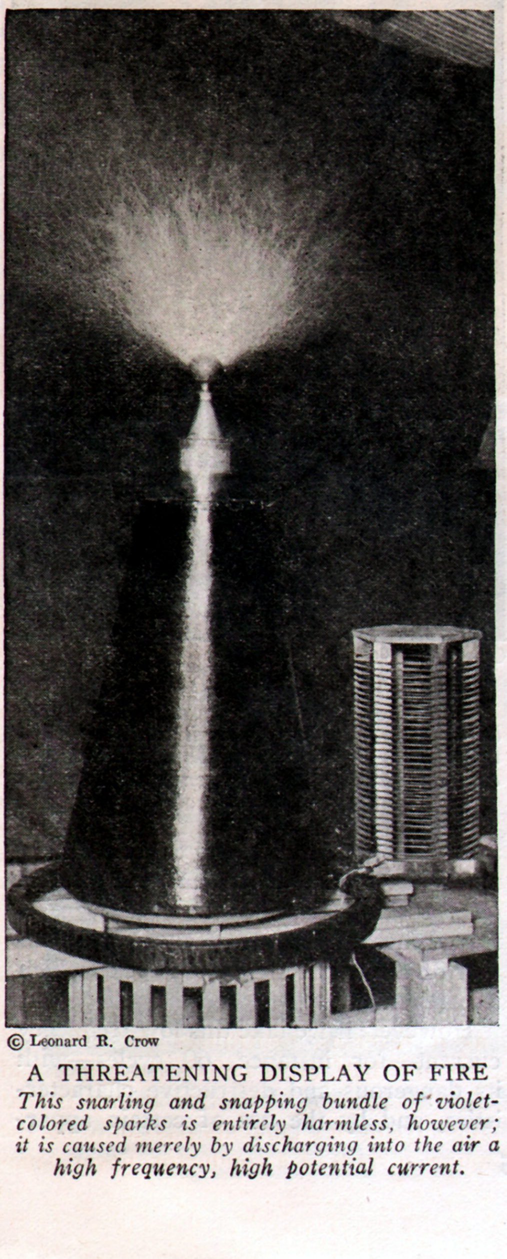
"SWALLOWING" 80,000 VOLTS

This voltage—which punctures a solid oak board an inch thick and sets it on fire—can be taken through the human body without discomfort—provided the frequency ranges above 30,000 cycles a second.

However, if we take this low frequency current—for instance, 60 cycles—with its dangerous and destructive characteristics, and by the use of certain apparatus increase its frequency, or number of alternations a second, until the frequency is raised many thousands of cycles a second, we change the characteristics of such a current completely. The current then ceases to be painful or dangerous when passed through the human body; and by increasing the potential it can be made to jump across a gap several feet in length, producing a crashing violet flame almost as harmless as the foods we eat. When such currents pass through our bodies we no longer experience shocks, but instead a pleasing sensation of mild warmth is produced, which has been said to have a beneficial effect upon the body.



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A THREATENING DISPLAY OF FIRE

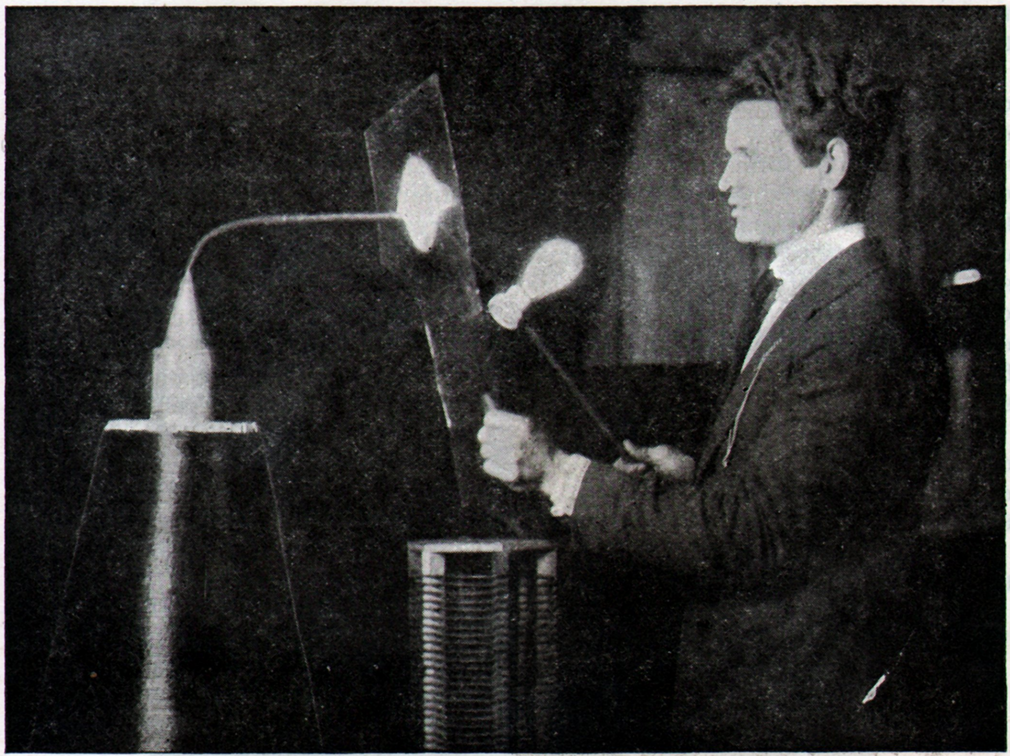
This snarling and snapping bundle of violet-colored sparks is entirely harmless, however; it is caused merely by discharging into the air a high frequency, high potential current.

When such a current of electrical energy is allowed to discharge through or into the air, the discharges assume the shape of hundreds of snarling, writhing, hissing flames of fire. But threatening as these flames appear, they are not dangerous to the body, as one would suppose. In the apparatus shown on this page, for example, I employed 1,800 watts of electricity. This same electric power at commercial frequencies would not begin to produce a spectacular display, but it would be thousands of times more dangerous to the human body.

If a coil consisting of five or six turns of heavy wire or ribbon is suspended in the air several inches above a high frequency electrical current of even moderately high potential, a current is induced in this secondary coil sufficient in voltage and amperage to light a 110-volt lamp, as shown in the picture on page 188.

With electricity at high pressures and at high frequencies, electrical energies may be passed into the human body sufficient in intensity and strength to produce arcs that give great light and heat. When this oscillating energy is transmitted into the body, passing through a plate of glass in which a 60-watt standard 110-volt lamp is lighted to incandescence, it appears to the eye that these currents actually pass through the glass. However, the current does not pass through the glass as an electric current, but rather in the form of electrostatic charges; the glass, after passing this heavy current, does not exhibit any physical change in the condition of its surface.

One of the most interesting features of this phenomenon is that the physiological effects of even extremely high frequency, high potential currents are found to be so very small that the current from a secondary terminal of the



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"MAKING AND MENDING" HOLES IN GLASS WITH CURRENT

The electricity transmitted into the body through a glass plate (lighting an incandescent globe on the other side) appears to pierce the glass. Actually, however, it passes in the form of electrostatic energy and leaves no mark whatever on the plate.

oscillation transformer can be taken through the body without any discomfort or inconvenience to the recipient (except perhaps a small burn produced by the discharge when taken directly upon the bare skin).

One should never attempt to take large currents directly into or upon the body without first receiving the current through some form of metal electrode. For instance, when one takes currents into the hand, the current should be taken from the machine through a metal rod which is held in the palm of the hand. In this manner a large contact area is offered to the flow of current, and thus, distributing the received currents over a large area, reduces the piercing or burning sensation to a minimum.

In taking currents into the mouth a common tablespoon may be used to advantage, as this affords a good contact with the tongue.

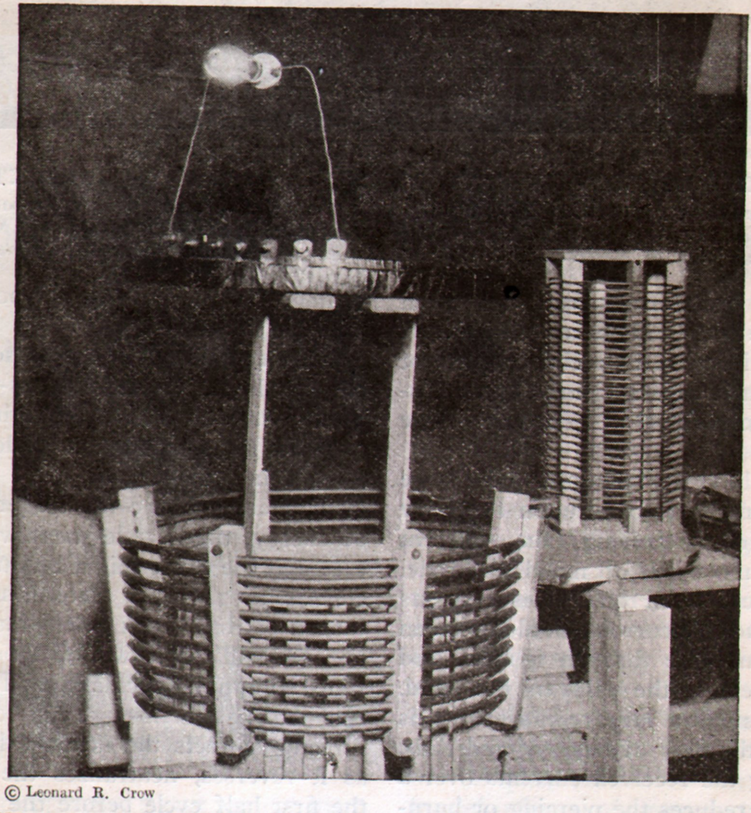
The peculiar effects of these currents may be due to several reasons—either to a different distribution through the body or to the tissues acting as condensers; although in the case of large high frequency coils that carry larger amounts of energy, the harmlessness would indicate that the cause might be due to other conditions not yet determined. One theory is that our nerves, fast as they are, are still too slow to respond to currents so rapidly oscillating. If the current that passes through the body in one direction affects the nerves, the current as it reverses, neutralizes the effect of the first half cycle before the nerve had time to respond. Another theory is that high frequency currents pass only on the outer surface of a conductor, never penetrating the body far enough to affect the nerves.

When the frequency and strength of currents flowing through the primary of a high frequency coil are varied, many different forms of secondary discharges are produced—thin, threadlike discharges, powerful, flaming discharges, and various forms of brush and streaming discharges. A high frequency current discharge, when properly produced, gives the appearance of a purple flame of burning gas under great pressure, emitting quantities of ozone.

The striking peculiarity of high frequency discharges, brushes and streamers, is the ease with which they pass through thick insulation.

However, this current is not confined to the use of spectacular and mystifying phenomena. Such high frequency, high potential currents, when properly applied to the body, are said to improve general nutrition and act as a tonic in building up the body; curing many diseases by stimulating the circulation.

Through the production of high frequency electricity we are capable of seeing the otherwise invisible. The X-ray, one of the greatest discoveries of man, is possible through the use of high frequency waves. Today man is capable of transmitting his very thoughts across great distances with incredible speed and accuracy without the aid of any visible transmitting medium. Were it not for this mysterious rapidly vibrating radio frequency electricity, wireless telegraphy and telephony would still be a thing unknown.



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LIGHTING AN INCANDESCENT LAMP "WITHOUT A CONNECTION"

The energy for lighting the standard 110-volt globe is sent through the air. This current is induced in a coil consisting of five or six turns of copper wire suspended above a primary coil in which high frequency current is flowing.